User's Manual

Oxygen Transmitter

Meters Covered

ESCM-37	ESCM-38
(25% O2)	(95% O2)

WARNING!

Install GasLab ® software before connecting your CO2Meter product(s) to your computer. Failure to do so may affect the ability for GasLab® to detect your meter.

Save meter information for future reference

Serial Number: _____

Purchase Date: _____

WARNING!

Install this software before connecting your CO2Meter product(s) to your computer.

Failure to do so may affect the ability for GasLab® to detect your meter. If this happens, please follow the instructions shown in the "*USB Driver Installation Instructions*" section on page 20 of this manual.

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Welcome

Thank you for purchasing our meter.

Please take some time to read through this manual in order to become familiar with the meter. Also, please pay special attention to the important safeguards shown on the next page.

Important Safeguards

To reduce the risk of fire, electrical shock and/or injury to persons, basic safety precautions should always be followed when using electrical appliances, including the following:

1. READ ALL INSTRUCTIONS BEFORE USING THIS METER.
2. INSTALL GasLab® SOFTWARE BEFORE CONNECTING METER TO A COMPUTER.
3. Use only the included power supply to operate this meter.
4. Do not operate this meter if the enclosure is opened.
5. Do not operate the device if it is malfunctioning.

SAVE THESE INSTRUCTIONS!

Package Contents

Please verify that your package contains the following items before using the meter:

All units include:

- (1) Meter
- (1) International power supply
- (1) 2-meter USB to RS-485 cable
- (1) Certificate of Calibration
- (1) User manual

Figure 1: NEMA4 Data Logger with accessories

GasLab® Software

IMPORTANT: MAKE SURE TO INSTALL SOFTWARE BEFORE CONNECTING YOUR METER TO YOUR COMPUTER

Minimum System Requirements

To utilize our free software, the computer must meet the following minimum requirements:

- 1GHz processor with 1GB RAM, 1GB free disk space (2GB free disk space for 64-bit systems).
- Windows XP*/7/8/8.1 with Microsoft .NET Framework 4.0** or later.
- On Intel-based Mac computers, GasLab® software can run using a Windows 7/8 virtual machine software such as *VMware Fusion*® or similar.

*Microsoft .NET is not supported on Media Center or Tablet editions.
**Installer will optionally install .NET Framework.

Visit **www.co2meter.com/pages/downloads** to download our complimentary GasLab® software to your computer. You can also download the GasLab®'s user manual in PDF from this page.

Please read the GasLab®'s user manual carefully to become more familiar with how the software works so that you can get the maximum benefit from this useful tool.

Install the GasLab® software first to ensure that the proper driver, necessary for the meter, is installed on your computer before connecting the meter.

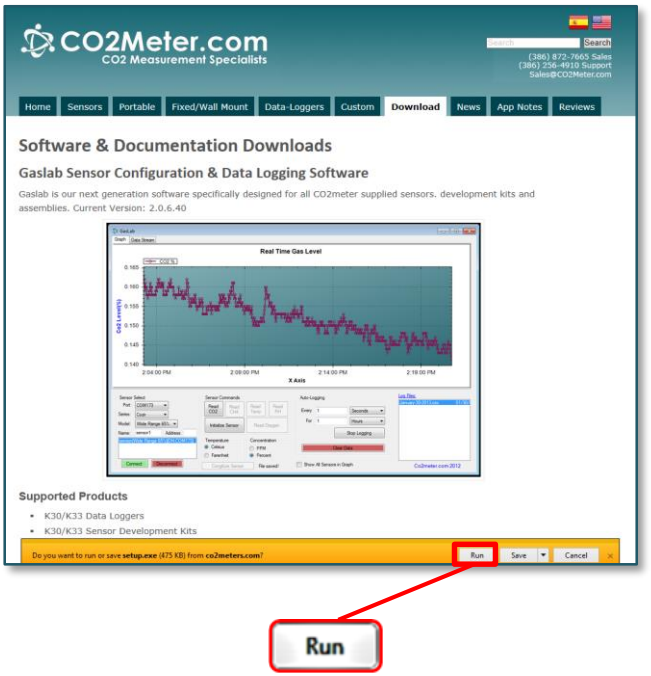

Figure 2: GasLab® download page (Internet Explorer 11 shown)

Follow the on-line prompts to complete the installation process.

NOTE: We strongly recommend allowing GasLab® to install drivers for the meter automatically.

Software Capabilities

Our GasLab® software will allow users to:

- Manage and download logs
- Configure Sensor
- Adjust logging intervals
- Calibrate the meter

- Automatic data logging when meter is powered ON
- Data logging session status displayed on LCD screen
- Collect data real-time

Powering the Meter

This meter can be powered by hardwiring 24 VDC power through the MDCM-4FP-2M Cable (included) but sampling units can also be powered by the included 24VDC international wall power supply.

Product Overview

The oxygen transmitter is a long life oxygen level transmitter that provides multiple analog linear outputs of O2 concentrations. It is designed to be rugged, maintenance-free and can be calibrated in normal air of any known oxygen concentration. Multiple units may be daisy chained for via RS485.

Scientific devices such as this level controller require the user to have an intimate knowledge of the meter, its operation, the required software, and the meter specifications prior to use. Edaphic Scientific highly recommends reading this user's manual before operating the device, especially the *Important Safeguards* section on page 5.

These meters store collected data to their internal memory to be retrieved at a later time for analysis. When combined with our GasLab® software, you can also see real-time data on your computer's screen.

The table below shows the different level controller models and their typical applications.

Model #	O2 Level
ESCM-37	0 - 25%
ESCM-38	0 - 100%

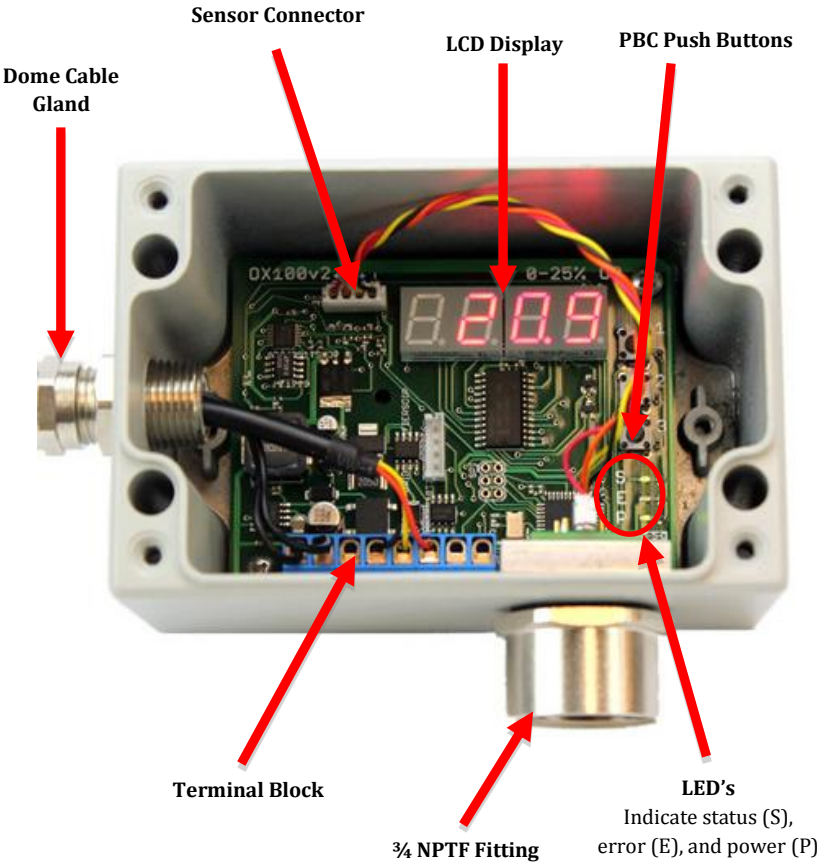

Figure 3: Instrument Overview

Component Description

- **Display** – Main interface to view current sensor readings and menu state. Will blink "STRT" upon applying power while the sensor warms up and stabilizes.
- **LED's** – are in for lower right corner of the unit on the main PCB and are labeled S, E and P.
    a. **"S" LED** – Status LED. Blinks every time a complete measurement cycle is performed and the value is updated. Serve's as a heartbeat for transmitter operation.
    b. **"E" LED** – Error LED. Will light if any abnormal conditions are detected within the device, primarily the sensor falling out of its recommended operating specifications will trigger this lamp.
    c. **"P" LED** – Power LED. Will be on continuously when power is applied to the unit.
- **PBC Buttons** - The unit has three surface mount buttons above the LEDs on the PCB. They can be gently and carefully pressed with your finger. These buttons allow you to access all aspects of sensors operation and test or calibrate different functional modules.
- **Terminal Block** – Allows power and output hard wiring.
- **Sensor Connector** – Allows simple interfacing between sensor and board.
- **Dome Cable Gland** – Industrial liquid-tight strain-relieved gland allows cable(s) routing to hardwire on terminal block.

Terminal Connectors

Figure 4 below shows a labeled representation of the terminal block on the board inside these meters.

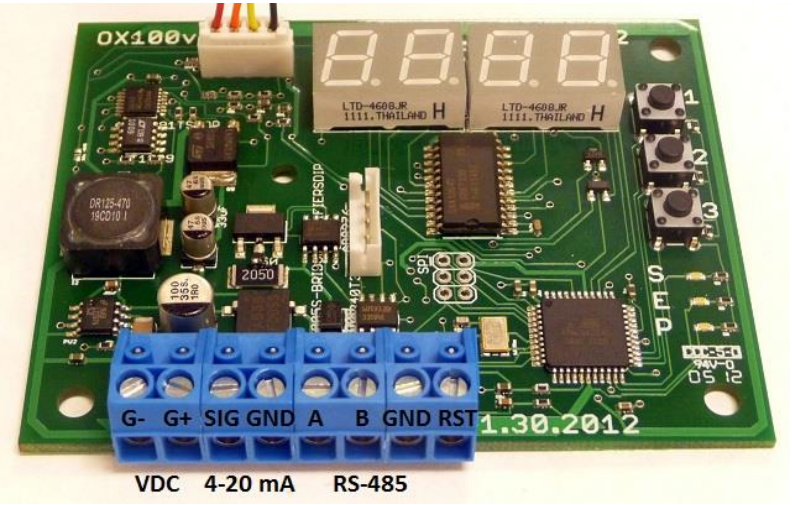

Figure 4: Labeled terminal block (connections)

- VDC = G- G+
- O2 4-20mA = SIG GND
- RS-485 INTERFACE = A B GND
- RESET = RST

MODBUS/RS-485

The internal oxygen sensor supports MODBUS protocols over RS-485, unidirectional transmission at 9600kbps.

The following MODBUS registers are available:

Input Registers

1. O2 Value, x10
2. Raw ADC Value

Holding Registers

1. O2 Span Value (4 byte floating number, part 1)
2. O2 Span Value (4 byte floating number, part 2)
3. O2 Pot Value
4. 4-20mA output Zero Value
5. 4-20mA output Span Value (4 byte floating number, part 1)
6. 4-20mA output Span Value (4 byte floating number, part 2)
7. Control Register
8. Status Register

The following commands are available:

- 0x03 – Read Holding Register
- 0x04 – Read Input Register
- 0x06 – Write Holding Register

LCD Display

The Liquid Crystal Display (LCD) touchscreen shows the following features:

- Gas concentration level in parts-per-million (ppm) or in percentage format (##.##%) for all the models

Theory of Operation

The zirconia oxygen sensor utilizes solid-state electrochemical reactions to produce a voltage proportional to the current oxygen. This voltage is then digitalized and filtered to a usable value. The oxygen sensor has also been factory calibrated to meet specifications.

Operation Guide

Make sure you read through these instructions thoroughly before using the meter. This guide will help you become more familiar with the meter in order to be as productive as possible in a short period of time. Please read the *Important Safeguards* on page 5 before continuing.

IMPORTANT: Follow these instructions to ensure proper set up:

1. Start by downloading the GasLab® Software to your computer as shown in the ***Figure 2*** on page 8.
2. Power the meter.
   NOTE: connecting the included USB cable to a port in a computer will not supply the appropriate power.
3. Turn *ON* the meter.

Connecting Meters

The first time the meter is connected to your computer, the operating system will install the necessary USB drivers as shown in ***Figure 5.*** This process could take a few minutes.

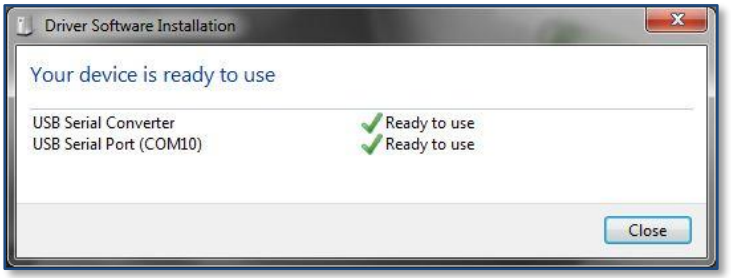

Figure 5: USB Driver Installation.

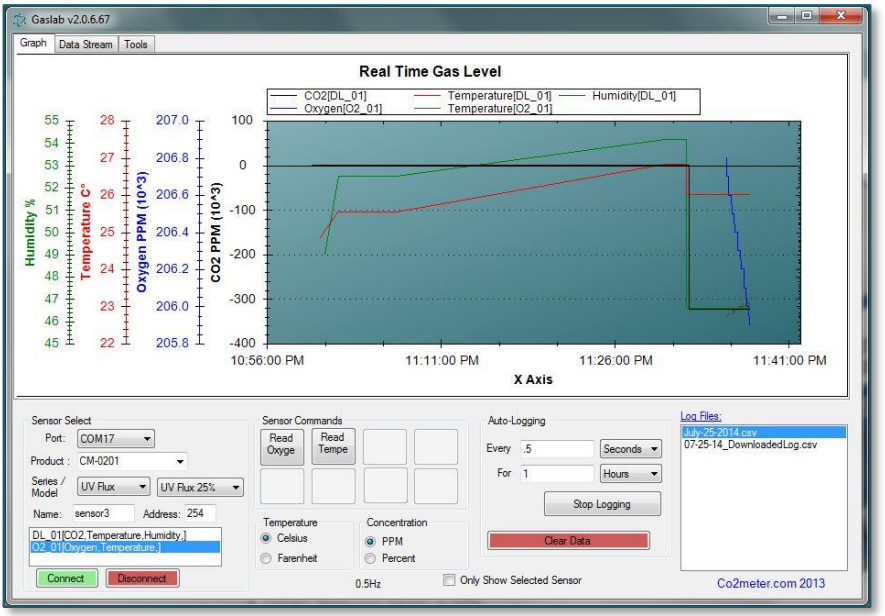

Figure 6: Collecting data in real time

Entering the Service Menu

To enter the service menu the buttons must be pressed in a factory-set order. This code can be customized before shipment but by default will be 1-2-3. The buttons must be pressed within a half second of each other, else the unit will return to standard operating mode. When in the service menu the unit will not update the current O2 readings. Once you enter the menu the display will read "1225 or 1295".

Standard Operation

The O2 transmitters comes factory calibrated for easy installation. During its life cycle calibration may become periodically necessary. We recommend performing a span O2 calibration every month for guaranteed operation and ensured accuracy. Calibration is recommended every six months.

Calibration

The calibration process varies depending on the type of unit and whether it has optional data logging functionality or not. All units are factory-calibrated with multiple reference points of gas, and have been verified to be accurate within their specific functionality before shipment. However, if the unit is severely jolted or otherwise mechanically disturbed, the sensor can drift requiring recalibration. All calibration procedures follow a single-point calibration routine that effectively shifts the zero-point of the O2 sensor.

Calibration using MODBUS or PC Connection

You can Download the software directly and free from this link in our website.

More precise calibrations can be performed using the PC connection. The unit can be attached to a PC using an optional USB to RS-485 cable, available on our website, or via a mini-USB cable to the internal USB connection.

In the desktop software application O2 can be calibrated individually. The O2 sensor can be calibrated to 0% and then to 20.9%.

During normal operation 0% calibration of the oxygen transmitter should not be necessary.

Calibration can also be performed over MODBUS, see additional documentation for MODBUS registers.

Calibration can be performed using either 0% CO2 calibration gas (typically nitrogen, Argon, etc.), or using a fresh source of air, assumed to be approximately 20.9% O2.

Attach calibration gas to the unit and connect the unit to a personal computer. Open the calibration screen in the GasLab software. Click the "Calibrate" button in the calibration tab for the desired gas, located in the "Configure Sensor" screen. As long as the gas concentration is stable, the unit should instantly reflect the calibrated value. This can be confirmed by watching the display.

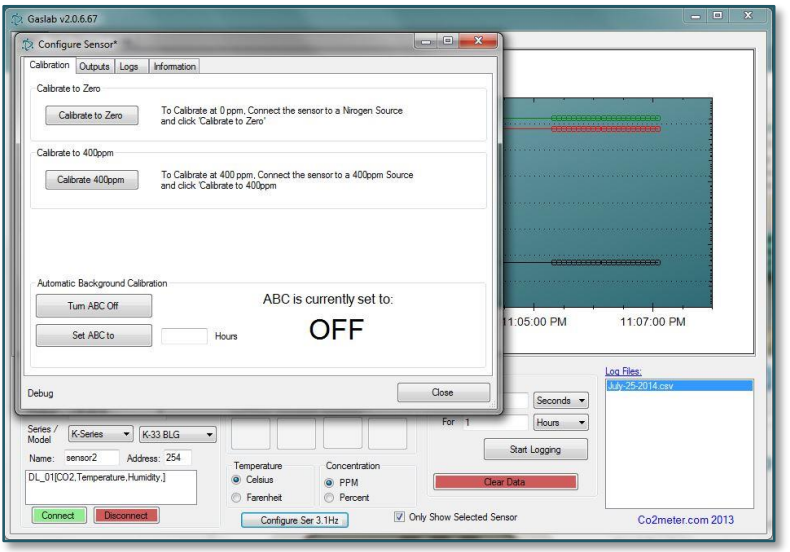

Figure 7: Data logger calibration screen for 0-1% CO2

Atmospheric Span Calibration

1. Allow sensor to stabilize for at least 1 hour
2. Ensure the sensor is exposed to fresh air
3. Enter the service menu
4. Press 2 to enter the Oxygen submenu
5. Press 2 again to perform the atmospheric calibration

Zero Point 0% Oxygen Calibration

1. Allow sensor to stabilize for at least 1 hour
2. Screw on the calibration adapter
3. Apply N2 calibration gas
4. Wait 5 minutes for stable readings
5. Enter the service menu
6. Press 2 to enter the Oxygen submenu
7. Press 1 to calibrate

Meter Specifications

O2 Sensor Performance and Ratings	**Measuring Principle**	Zirconium dioxide (ZrO2)
	Measuring Range	0-25% (25% O2)
		0-95% (95% O2)
	Accuracy	±2% full scale (all ranges)
	Repeatability	±0.05% or ±0.02% for 25% or 95% O2, respectively, ±1% of measured value
	Sensitivity	±20 ppm ±1% of measured value
	Warm-up Time	<15 min. (instant measurements)
	Response Time	4 sec. max. diffusion
	Life Expectancy	>15 years
	Maintenance Interval	No maintenance required
Outputs	**Voltage**	0 – 10 VDC
	O2 Value	4-20 mA linearly scaled
	RS-485	Modbus interface
Power	**Input Voltage**	24 VDC ±10%
	Current Consumption	600 mA @ 24 VDC
Dimensions	**WxHxD** in(mm)	4.7(120) x 3.2(80) x 3.2(81)

Troubleshooting Guide

Symptom / Issue	Possible Cause / Resolution
Device is not recognized by PC/OS	Make sure meter is connected properly to a suitable 24VDC power supply and that the USB cable is properly connected to a computer.
Device doesn't power ON	Perform resolution above and make sure that there is adequate power to the meter.
The GasLab® software doesn't start *1	Your software might be out of date. Update your software by either visiting our download webpage at http://www.co2meter.com/pages/downloads or by selecting the "Check for Updates" under the *Help* menu. Make sure your PC meets the minimum requirements.
Reading doesn't change	Calibration or recalibration needed.

*For more troubleshooting tips on GASLAB® software, see GASLAB® manual located at www.co2meter.com/pages/downloads.

USB Driver Installation Instructions

To install the appropriate USB port drivers compatible with your meter, follow these steps:

1. Go to http://www.ftdichip.com/Drivers/VCP.htm and download the package appropriate for the version of Windows installed in your computer.
2. Move the file you downloaded to a location you can easily access. Make sure you have administrator privileges.
3. Extract the file by right clicking on it and selecting ***extract here.***
4. Go to your computer's Device Manager in the ***Control Panel***.

- For Windows 8, press the Windows key and 'x' at the same time to bring up the start menu then click on ***Device Manager***.
- For Windows 7, open the start menu and type ***Device Manager*** in the search bar.

5. Find the ***Unrecognized USB Device*** in the list (it usually, but not always, has a yellow triangle icon).
6. Right click the ***Unrecognized USB Device*** item and select ***Update Driver Software***.
7. Select ***Browse My Computer*** and point to the folder where you extracted the driver files to (step #3).

This will install the necessary drivers to your computer and allow you to use your meter with GasLab®. If you have multiple meters, you should only have to perform this procedure once; the operating system will automatically find the driver for all the other sensors.

Support

The quickest way to obtain technical support is via email. Please send all support inquires to info@edaphic.com.au

Please include a clear, concise definition of the problem and any relevant troubleshooting information or steps taken so far, so we can duplicate the problem and quickly respond to your inquiry.

Warranty

This meter comes with a 1YEAR (warranty period) limited manufacturer's warranty, starting from the date the meter was shipped to the buyer.

During this period of time, Edaphic Scientific warrants our products to be free from defects in materials and workmanship when used for their intended purpose and agrees to fix or replace (at our discretion) any part or product that fails under normal use. To take advantage of this warranty, the product must be returned to Edaphic Scientific at your expense. If, after examination, we determine the product is defective, we will repair or replace it at no additional cost to you.

This warranty does not cover any products that have been subjected to misuse, neglect, accident, modifications or repairs by you or by a third party. No employee or reseller of Edaphic Scientific's products may alter this warranty verbally or in writing.

Liability

All liabilities under this agreement shall be limited to the actual cost of the product paid to Edaphic Scientific. In no event shall Edaphic Scientific be liable for any incidental or consequential damages, lost profits, loss of time, lost sales or loss or damage to data, injury to person or personal property or any other indirect damages as the result of use of our products.

Returns

If the product fails under normal use during the warranty period, a RMA (Return Material Authorization) number must be obtained from Edaphic Scientific. After the item is received Edaphic Scientific will repair or replace the item at our discretion.

To obtain a RMA number, email us at info@edaphic.com.au

When requesting a RMA please provide reason for return and original order number.

If the product fails under normal use in the first 10 days of ownership, at our discretion we will email you a postage-paid UPS label to return the product at our expense.

If we determine that the product failed because of improper use (water damage, dropping, tampering, electrical damage etc.), or if it is beyond the warranty date, we will inform you of the cost to fix or replace the product.

Contact Us

We are here to help!

For information or technical support, please contact us.

info@edaphic.com.au
www.edaphic.com.au

Address:
PO Box 1843
Port Macquarie, NSW,
2444, Australia